

Optimism and Spontaneous Self-affirmation are Associated with Lower Likelihood of Cognitive Impairment and Greater Positive Affect among Cancer Survivors

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Abstract

Background Optimism and self-affirmation promote adaptive coping, goal achievement, and better health.

Purpose The aim of this study is to examine the associations of optimism and spontaneous self-affirmation (SSA) with physical, mental, and cognitive health and information seeking among cancer survivors.

Methods Cancer survivors ($n=326$) completed the Health Information National Trends Survey 2013, a national survey of US adults. Participants reported optimism, SSA, cognitive and physical impairment, affect, health status, and information seeking.

Results Participants higher in optimism reported better health on nearly all indices examined, even when controlling for SSA. Participants higher in SSA reported lower likelihood of cognitive impairment, greater happiness and hopefulness, and greater likelihood of cancer information seeking. SSA remained significantly associated with greater hopefulness and cancer information seeking when controlling for optimism.

Conclusions Optimism and SSA may be associated with beneficial health-related outcomes among cancer survivors. Given the demonstrated malleability of self-affirmation, these findings represent important avenues for future research.

Keywords Cancer survivors · Health Information National Trends Survey · Optimism · Self-affirmation · Cognitive impairment · Affect

Introduction

As cancer treatment improves, the number of people living beyond a cancer diagnosis is increasing, with nearly 18 million cancer survivors expected by 2022 [1]. As such, understanding how to promote physical and mental health among survivors is of utmost importance. Cancer and cancer treatment can significantly impair physical and mental health, with costs extending beyond immediate health effects of illness [2–4]. Health costs may include fatigue, pain, and other side effects [2–5] and poorer health-related quality of life ([6], but see [7]). Survivors may also experience mental health costs, including depressive symptoms [8] and chemotherapy-associated cognitive decline that can last 10 to 20 years post-treatment [9–12].

Identifying individual differences and psychological resources associated with positive physical and mental health outcomes among cancer survivors can inform interventions to improve health and functioning after cancer. Although these associations have been explored to some extent, gaps remain. Of note, little research has examined how cognitive symptoms among survivors may be influenced by psychosocial factors such as expectancies (e.g., optimism) or self-affirmation [9]. Current treatment and prevention approaches for chemotherapy-associated cognitive decline include pharmacological approaches and cognitive rehabilitation but not psychosocial approaches [13–15]. Relatedly, little research has examined specific mechanisms that account for whether interventions to improve cancer survivors' well-being and functioning are effective, suggesting a need to further explore

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the role of psychosocial factors [16]. We examine one well-established and one more novel psychological resource that may be associated with better health—dispositional optimism and self-affirmation, respectively.

Optimism

Dispositional optimism is a personality trait characterized by a general tendency to hold positive expectations about the future [17] that functions as a psychological resource conferring health benefits [18–20]. Health benefits may result from optimists' use of more active than avoidant coping strategies and greater persistence when striving to achieve goals [18, 19, 21]. Evidence suggests that greater optimism among cancer survivors is associated with a variety of positive outcomes, including greater happiness, positive affect, and quality of life, and less depression, sexual impairment, fatigue, and distress, among others [22–24]. Little research has examined the association of optimism with cognitive or physical impairment among cancer survivors (but see [23]).

Self-Affirmation

In contrast to the more well-established literature on optimism among cancer survivors, there is less research examining the >role of self-affirmation with respect to cancer survivorship. According to self-affirmation theory, people are motivated to view themselves as globally moral and competent [25]. To maintain these positive views, people are often defensive against information or situations that threaten this self-image, such as threatening health messages [26]. However, when people self-affirm—for example, by following instructions to reflect on personally important values [27]—they alter their perspective to view challenges to positive self-beliefs as less threatening, which can lead to healthier behaviors, lower stress, and greater meaning-making [26]. Much of the research on self-affirmation uses experimental inductions (demonstrating that self-affirmation is malleable). However, recent evidence suggests that self-affirming, such as by reflecting on values and strengths, when facing a threatening or anxious situation in everyday life is naturally occurring and measurable [28–30]. We refer to this tendency to self-affirm as spontaneous self-affirmation (SSA). Using the larger national panel from which the current survivor sample is taken, we found that SSA was associated with more positive and less negative affect, better self-reported health [31], and multiple measures relevant to the health care experience, including better perceived communication with providers and quality of care, and greater health information seeking [32].

We are aware of little research that has examined self-affirmation among cancer survivors. In a study that examined expressive writing among breast cancer survivors, SSA was

prospectively linked to fewer physical symptoms and lower distress [33]. Other work (not restricted to cancer survivors) has shown that induced self-affirmation reduced cortisol in response to threat [34] and decreased stress in the context of performance [35]. Given these demonstrated benefits, we considered it useful to examine whether SSA was associated with positive outcomes in a sample of cancer survivors.

There are multiple avenues through which self-affirmation could influence survivors' health. Cognition might be negatively affected by stereotype threat (i.e., anxiety about fulfilling a negative stereotype that leads to behavior consistent with that stereotype) if survivors are aware of cognitive impairments that can accompany chemotherapy [9]. Because self-affirmation can improve cognitive performance in the context of stereotype threat [36, 37], survivors who self-affirm may experience cognitive benefits. Self-affirmation can also reduce information avoidance [38, 39], promote attention to relevant threat [40], and lead to more abstract construal and broader perspectives [26]. Further, self-affirmation could be a resource for coping with a cancer diagnosis if it offsets negative affect and reactions to awareness of heightened mortality risk [41]. Some of these potential mechanisms may be relevant to cancer survivors specifically as well as to a more general population.

Current Study

In the present study, we used data from a nationally representative cross-sectional survey (Health Information National Trends Survey) to examine the associations of optimism and spontaneous self-affirmation with physical, mental, and cognitive health and information seeking among cancer survivors. We characterized cancer survivors as anyone who reported a cancer diagnosis, consistent with a definition of cancer survivorship beginning at the moment of a cancer diagnosis [42]. We predicted that both optimism and SSA would be associated with beneficial outcomes. Because the measure of SSA is novel and it is largely unknown whether SSA and optimism represent similar constructs, we ran two sets of analyses with optimism and SSA as separate and simultaneous predictors.

Because of the limited prior work on SSA, we further examined four potential moderators of the associations of SSA with health-related measures. First, because self-affirmation has been previously associated with decreased stress responses only among those high in self-resources, including optimism [34], we expected individuals high in both optimism and SSA to report better health. Second, based on research in which the authors posited that increased self-efficacy for coping with cancer may have led to better health outcomes among those who spontaneously self-affirmed [33], we also predicted that associations among SSA and health-related measures would be stronger among those lower in self-efficacy for managing one's health, as SSA might boost perceptions of efficacy-related resources and self-affirmation tends to be of greater benefit to

those experiencing the most threat [26]. Third, we tested whether SSA interacted with time since diagnosis and a composite variable of gender and cancer site. We expected associations among SSA and health-related measures to be stronger among respondents more recently diagnosed, as lower quality of life is generally associated with more recent diagnosis [6, 43]. Finally, we expected associations among SSA and health-related measures to be stronger among women with breast cancer than among men or women with other types of cancer, as those with breast cancer may be more likely to cope by seeking support [44], and thus may perceive less threat. However, we are aware of little research that compares perceived threat across cancer types.

Methods

Study Design and Population

We report data from the Health Information National Trends Survey 4, Cycle 3, a cross-sectional nationally representative survey conducted from September through December 2013 and completed by 3185 individuals. We analyze data from a subset of 326 respondents who indicated having a personal history of cancer, described below. Details of the study design are available elsewhere [45]. Of note, it is common for large-scale studies such as the Health Information National Trends Survey to use shortened or single-item measures of constructs. As noted in the “Introduction,” the associations of SSA with some of the outcomes assessed here have been examined elsewhere using the full Health Information National Trends Survey 4 Cycle 3 sample (i.e., affect and self-reported health [31] and health and cancer information seeking [32]). In the former study, SSA was significantly associated with all affect assessments other than anxiety; in the latter, SSA was associated with health information seeking. However, direct comparisons across findings cannot be made due to differences in the analytic procedure concerning statistical weights, sample size, and the covariate strategy.

Measures

Dispositional Optimism

Dispositional optimism was assessed with one item from the Revised Life Orientation Test [46], “I’m always optimistic about my future” from 1 (*strongly agree*) to 4 (*strongly disagree*). This item was reverse scored so that higher scores indicated greater optimism. A single item has been used to assess dispositional optimism in another national survey [47], and results using this single-item measure have been consistent with results using the optimism subscale of the Revised Life Orientation Test [48].

Spontaneous Self-Affirmation

Spontaneous self-affirmation was assessed as the average of two items taken from a longer scale currently in development [28], “When I feel threatened or anxious I find myself thinking about my strengths [values]” from 1 (*strongly agree*) to 4 (*strongly disagree*; $r=0.725, p<0.001$). The full scale includes two key subscales assessing strengths and values with high reliability; the two items used here load highly on their respective subscales and reliability decreases when these particular items are omitted [28]. A similar two-item index has previously been used successfully to examine spontaneous self-affirmation [39, 49]. Items were reverse scored so that higher scores indicated greater affirmation.

Subjective Cognitive Impairment

Subjective cognitive impairment was assessed with the item, “Because of a physical, mental, or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions?” (coded as 1=Yes, 0=No). This item is one of several standard items recommended for use by the US Department of Health and Human Services in national population health surveys to assess disability status [50].

Physical Impairment

Physical impairment was assessed by three items, “Do you have serious difficulty walking or climbing stairs?”, “Do you have difficulty dressing or bathing?”, and “Because of a physical, mental, or emotional condition, do you have difficulty doing errands alone such as visiting a doctor’s office or shopping?” (Yes, No). These items are also recommended for use in national surveys to assess disability status [50], along with the previously reported item about cognitive impairment and two items assessing difficulty seeing and hearing. To reduce skew, responses were dichotomized as 1 (responding yes to one or more items) or 0 (responding no to all three items).

Information Seeking

Information seeking was assessed with two separate items: “Have you ever looked for information about health or medical topics from any source?” and “Have you ever looked for information about cancer from any source?” (coded as 1=Yes, 0=No).

Self-efficacy for getting health information

Self-efficacy for getting health information was assessed with the item, “Overall, how confident are you that you could get advice or information about health or medical topics if you needed it?” from 1 (*not confident at all*) to 5 (*completely confident*).

Self-Efficacy for Managing Health

Self-efficacy for managing health was assessed with the item, “Overall, how confident are you about your ability to take good care of your health?” from 1 (*not confident at all*) to 5 (*completely confident*).

State Affect

State affect was assessed with five separate items, “In the past 30 days, how often have you felt...” (1) happy, (2) hopeful, (3) angry, (4) anxious, and (5) sad, on a scale from 1 (*never*) to 5 (*always*). These items were adapted from items assessing positive and negative affect in another national survey [51].

Self-Reported Health

Self-reported health was assessed with the item, “In general, would you say your health is...” from 1 (*poor*) to 5 (*excellent*).

Personal History of Cancer and Time Since Diagnosis

Personal history of cancer was assessed as agreement with the item “Have you ever been diagnosed as having cancer?” If participants answered *yes*, they were asked to mark all that apply in response to the item, “What type of cancer did you have?” Participants who indicated a personal diagnosis of only non-melanoma skin cancer were categorized as *not* having a history of cancer; non-melanoma skin cancers are typically excluded from cancer prevalence estimates. Given the distribution of the cancer sites among Health Information National Trends Survey respondents and the preponderance of psychosocial interventions tailored for female breast cancer patients as compared to patients with other cancer types, cancer site was categorized according to gender and site of cancer diagnosis: female breast cancer, female non-breast cancer, and male cancer. To determine *time since diagnosis*, responses to “At what age were you first told that you had cancer?” were subtracted from participant age. Responses were categorized as *0 to 2 years* (treatment and recovery period), *3 to 5 years* (transition to survivorship), and *6 or more years* (long-term survivorship) since cancer diagnosis. No questions about cancer treatment were included in the Health Information National Trends Survey.

Sociodemographic Factors

We examined selected sociodemographic factors: gender, race and ethnicity, age in years, education, and household income. Marital status was dichotomized as those who indicated being married or living as married versus those who indicated being divorced, widowed, separated, or single/never been married.

Overview of Analyses

We first tested whether optimism and SSA differed according to any sociodemographic or medical factors (i.e., time since cancer diagnosis and cancer site by gender). We next used partial correlations and logistic regressions to examine whether optimism and SSA were associated with health outcomes, controlling for selected sociodemographic and medical factors (selection criteria described below). Logistic and linear regression analyses were then used to test whether optimism and SSA were significant predictors of outcomes when included in models simultaneously and when controlling for selected sociodemographic and medical factors. Finally, we used hierarchical linear and logistic regressions to conduct exploratory analyses examining whether the associations of SSA with health outcomes were moderated by optimism, self-efficacy for managing health, time since diagnosis, or gender and cancer site, controlling for the factors specified in the primary regression analyses. Pairwise deletion was used to account for missing data and therefore sample sizes differ across analyses. Although statistical weighting procedures are typically used to analyze Health Information National Trends Survey data, weighted analyses were not used here because they are less necessary when doing hypothesis testing rather than population estimation and because their application becomes unstable in small sample sizes.

Selection of Covariates

Due to concerns about multicollinearity and reduced statistical power, we controlled only for sociodemographic or medical factors that were significant at $p < 0.05$ in bivariate associations with a particular outcome. The following potential covariates were examined: age, race/ethnicity, education, time since cancer diagnosis, and cancer site by gender. Income was not considered as a covariate because the income variable was not adjusted for cost of living by locality in the Health Information National Trends Survey dataset, rendering it an imprecise measure of socioeconomic status. Consistent with previous research in national datasets (e.g., [52]), we considered education to be a proxy for socioeconomic status.

Results

Participant Characteristics and Associations among Health Outcomes

Characteristics of the 326 cancer survivors analyzed in the present study are reported in the leftmost column of Table 1. The majority of respondents were non-Hispanic White (67.5 %). Over half were female (60.7 %). The average age of the sample was 65.3 years (SD=13.69, range=24 to

Table 1 Bivariate associations of sociodemographic and cancer-related factors with optimism and self-affirmation among cancer survivors, $n=326$

Participant characteristic	Optimism			Spontaneous self-affirmation		
		<i>r</i>	<i>p</i> value		<i>r</i>	<i>p</i> value
Age, $n=321$		-0.018	0.747		-0.076	0.175
Income, $n=279$		0.084	0.162		0.004	0.946
	Mean (SD)	<i>t</i> value	<i>p</i> value	Mean (SD)	<i>t</i> value	<i>p</i> value
Gender						
Male, $n=122$	3.17 (0.75)	-0.950	0.343	2.77 (0.84)	0.195	0.846
Female, $n=198$	3.09 (0.81)			2.79 (0.85)		
Marital status		-0.132	0.895		1.910	0.057
Married or living as married, $n=155$	3.12 (0.69)			2.69 (0.79)		
Not married, $n=163$	3.11 (0.85)			2.87 (0.87)		
	Mean (SD)	<i>F</i> value	<i>p</i> value	Mean (SD)	<i>F</i> value	<i>p</i> value
Education		0.934	0.394		0.719	0.488
Less than high school education, $n=37$	3.14 (0.82)			2.68 (0.97)		
High school graduate or some college, $n=175$	3.07 (0.82)			2.76 (0.83)		
College graduate, $n=106$	3.20 (0.65)			2.85 (0.79)		
Race/ethnicity		2.331	0.099		2.136	0.120
Hispanic or Latino, $n=33$	3.34 (0.70)			2.76 (0.88)		
Non-Hispanic White, $n=216$	3.05 (0.78)			2.73 (0.82)		
Non-Hispanic Black or African American, $n=46$	3.20 (0.83)			3.01 (0.83)		
Time since diagnosis		1.033	0.357		0.574	0.564
0–2 years, $n=63$	3.02 (0.75)			2.68 (0.75)		
3–5 years, $n=66$	3.21 (0.78)			2.83 (0.76)		
6 years or more, $n=179$	3.12 (0.79)			2.80 (0.90)		
Cancer site and gender		0.531	0.589		1.064	0.346
Female breast, $n=71$	3.06 (0.77)			2.90 (0.78)		
Female non-breast, $n=127$	3.17 (0.75)			2.77 (0.84)		
Male non-breast, $n=122$	3.10 (0.83)			2.72 (0.88)		

96 years), consistent with that of an aging survivor population [53]. The median household income was \$35,000 to \$49,999, and the median educational attainment was “some” college. The majority of respondents reported being diagnosed with cancer six or more years previously (54.9 %), and the majority of cancers were either non-breast cancers reported by women (39.0 %) or non-breast cancers reported by men (37.4 %). As shown in Table 1, neither optimism nor SSA was significantly associated with any sociodemographic or medical factor. Bivariate correlations among health-related outcomes are reported in Table 2. Means and standard deviations of outcomes are also reported in Table 2. Of note, 12 % reported cognitive impairment and 27 % reported physical impairment.

Optimism, SSA, and Associated Health Outcomes

Optimism and SSA were moderately positively correlated in this sample ($r=0.368$, $p<0.001$), suggesting that they

assess related but distinct constructs. We used partial correlations to examine whether optimism and SSA were associated with self-reported physical, mental, and cognitive health outcomes and information seeking, controlling for selected sociodemographic and medical factors (described in the notes for Tables 3 and 4). As shown in Tables 3 and 4 and consistent with predictions, greater optimism was significantly associated with all outcomes, except for health and cancer information seeking, in the direction of less impairment, better subjective health, more positive and less negative affect, and greater efficacy. Greater SSA was significantly associated with greater happiness, hopefulness, and self-efficacy for getting health information, lower likelihood of cognitive impairment, and greater likelihood of seeking cancer information. SSA was not significantly associated with self-reported health, negative affect, physical impairment, or health information seeking.

Table 2 Bivariate correlations among physical, mental, and cognitive health factors and information seeking, and means and standard deviations

	1. Self-reported health	2. Happiness	3. Hopefulness	4. Anger	5. Anxiety	6. Sadness	7. Self-efficacy for getting health information	8. Subjective cognitive impairment ^a	9. Subjective physical impairment ^a	10. Health information seeking ^a	11. Cancer information seeking ^a
1.	–	0.40**	0.22**	-0.21**	-0.32**	-0.31**	0.23**	-0.41**	-0.39**	0.20**	0.05
2.		–	0.37**	-0.38**	-0.41**	-0.50**	0.19**	-0.31**	-0.24**	-0.01	-0.03
3.			–	-0.17**	-0.16**	-0.25**	0.15*	-0.31**	-0.21**	0.06	-0.02
4.				–	0.41**	0.51**	-0.11 [^]	0.22**	0.15*	0.01	0.03
5.					–	0.50**	-0.16**	0.28**	0.26**	0.04	0.01
6.						–	-0.19**	0.33**	0.29**	-0.02	0.04
7.							–	-0.17**	-0.13*	-0.07	0.06
8.								–	0.41**	-0.08	-0.01
9.									–	-0.06	-0.07
10.										–	0.45**
11.											–
Mean	3.08	3.73	3.60	2.12	2.33	2.13	3.86	0.12	0.27	0.80	0.82
SD	0.93	0.77	1.08	0.79	0.99	0.87	1.06	0.32	0.44	0.40	0.39

[^] $p < 0.10$; * $p < 0.05$; ** $p < 0.01$

^a 1 = Yes, 0 = No

Associations of Optimism, SSA, and Associated Health Outcomes Simultaneously Controlling for Optimism and SSA

Next, regression analyses were used to test whether optimism and SSA were significant predictors of outcomes when included in models simultaneously and when controlling for selected sociodemographic factors (covariates for each outcome are the same as those used in the partial correlation analyses). Results are shown in Tables 5 and 6. When both SSA and optimism were included as predictors, optimism remained significantly associated with all outcomes in the direction of better health but was not associated with information seeking. When controlling for optimism, SSA remained associated with greater hopefulness ($p = 0.014$) and greater likelihood of cancer information seeking ($p = 0.028$) but was no longer significantly associated with lower likelihood of reporting cognitive impairment or greater happiness (although the association with cognitive impairment was marginally significant at $p < 0.10$). Additionally, greater SSA was associated with greater sadness ($p = 0.040$). Associations of the selected sociodemographic and medical factors with health outcomes are reported in Tables 5 and 6.

Ancillary Analyses: Moderators of Associations of SSA with Health Outcomes

Given that the role of SSA among cancer survivors has rarely been examined, we conducted exploratory analyses testing whether SSA interacted with the psychosocial factors of optimism and self-efficacy for managing health and the sociodemographic/medical factors of time since diagnosis and gender and cancer site to influence any health outcomes. Analyses controlled only for any factors significantly associated with a given outcome at the bivariate level, and only analyses testing the moderating effect of optimism controlled for optimism. We report only interactions significant at $p < 0.05$. These effects should be considered exploratory and hypothesis generating. Only 8 of 44 interactions tested were statistically significant, and only one of these significant interactions (i.e., the interaction of SSA with gender and cancer site predicting confidence in getting health information) met the significance level of $p < 0.001$ resulting from a Bonferroni correction for multiple comparisons.

Optimism

SSA and optimism interacted to significantly predict self-reported health ($\beta = -0.16$, $SE = 0.07$, $p = 0.018$). Surprisingly, simple slopes analyses [54] revealed that greater SSA was marginally associated with lower self-reported health for those high (one SD above the mean; $\beta = -0.15$, $SE = 0.08$, $p = 0.058$) but not low in optimism (one SD below the mean; $\beta = 0.09$, $SE = 0.09$, $p = 0.292$).

Table 3 Partial correlations of optimism and spontaneous self-affirmation with self-reported health, affect, and self-efficacy, controlling for selected sociodemographic and medical factors (see table note)

	Self-reported health	Happiness	Hopefulness	Anger	Anxiety	Sadness	Self-efficacy for getting health information
Optimism	0.19**	0.37**	0.38**	-0.22**	-0.27**	-0.29**	0.18*
Spontaneous self-affirmation	0.04	0.15*	0.27**	-0.05	-0.02	0.01	0.14*

Note: The associations of optimism and spontaneous self-affirmation were tested in separate analyses

Correlations of optimism and spontaneous self-affirmation with outcomes controlled for the following sociodemographic and medical factors that were significantly associated ($p < 0.05$) with that outcome at the bivariate level in preliminary analyses: self-reported health controlled for age and education; happiness controlled for time since diagnosis; anger controlled for age, education, and time since diagnosis; sadness controlled for education; self-efficacy for getting health information controlled for education

* $p < 0.05$; ** $p < 0.01$

Self-Efficacy for Managing One's Health

SSA and self-efficacy for managing one's health interacted to significantly predict 5 of the 11 outcomes: self-reported health ($\beta = -0.16$, $SE = 0.06$, $p = 0.014$), happiness ($\beta = -0.10$, $SE = 0.05$, $p = 0.040$), hopefulness ($\beta = -0.15$, $SE = 0.07$, $p = 0.027$), sadness ($\beta = 0.15$, $SE = 0.06$, $p = 0.016$), and health information seeking ($\beta = -0.44$, $SE = 0.19$, $OR = 0.65$, $p = 0.022$). The pattern of the interaction differed somewhat across analyses. Simple slopes analyses revealed that greater SSA was associated with greater self-reported health only when individuals reported low ($\beta = 0.17$, $SE = 0.08$, $p = 0.045$) but not high self-efficacy for managing health ($\beta = -0.09$, $SE = 0.07$, $p = 0.197$); this pattern was similar for happiness (low self-efficacy: $\beta = 0.19$, $SE = 0.07$, $p = 0.005$; high self-efficacy: $\beta = 0.02$, $SE = 0.06$, $p = 0.784$) and health information seeking (low self-efficacy: $\beta = 0.69$, $SE = 0.26$, $p = 0.008$; high self-efficacy: $\beta = -0.04$, $SE = 0.22$, $p = 0.859$). The association of greater SSA with greater hopefulness was significant when survivors were both low ($\beta = 0.47$, $SE = 0.09$, $p < 0.001$) and high in self-efficacy ($\beta = 0.21$, $SE = 0.09$, $p = 0.014$), with a strong association for those lower in self-efficacy. Greater SSA was not

associated with sadness for survivors low in self-efficacy ($\beta = -0.12$, $SE = 0.08$, $p = 0.161$) but was marginally associated with greater sadness when survivors were high in self-efficacy ($\beta = 0.13$, $SE = 0.07$, $p = 0.064$). In sum, SSA seems to be most strongly associated with self-reported health, positive affect, and health information seeking among survivors low in self-efficacy for managing their health.

Time Since Diagnosis

SSA and time since diagnosis (0–2 vs. >2 years) interacted to predict self-reported health ($\beta = 0.48$, $SE = 0.21$, $p = 0.025$). Specifically, SSA was associated with better self-reported health only for those recently diagnosed with cancer ($\beta = 0.47$, $SE = 0.16$, $p = 0.003$) but not for those whose diagnosis was 3 or more years ago ($\beta = -0.011$, $SE = 0.15$, $p = 0.937$).

Gender and Cancer Site

Finally, SSA interacted with gender and cancer site to predict confidence in getting health information ($\beta = 0.64$, $SE = 0.19$, $p = 0.001$). For women with a breast cancer diagnosis, SSA

Table 4 Odds ratios from logistic regressions of optimism and spontaneous self-affirmation predicting subjective cognitive and physical impairment and information seeking, controlling for selected sociodemographic and medical factors (see table note)

	Subjective cognitive impairment		Subjective physical impairment		Health information seeking		Cancer information seeking	
	OR	95 % CI	OR	95 % CI	OR	95 % CI	OR	95 % CI
Optimism	0.36**	0.23, 0.55	0.63**	0.44, 0.89	1.02	0.71, 1.47	1.26	0.84, 1.88
Spontaneous self-affirmation	0.52**	0.35, 0.80	0.77	0.55, 1.07	1.33^	0.95, 1.85	1.55*	1.07, 2.25

Notes

For all dependent variables, 1 = Yes, 0 = No

The associations of optimism and spontaneous self-affirmation were tested in separate analyses

Associations of spontaneous optimism and spontaneous self-affirmation with outcomes controlled for the following sociodemographic and medical factors that were significantly associated ($p < 0.05$) with that outcome at the bivariate level in preliminary analyses: subjective cognitive impairment controlled for education; subjective physical impairment controlled for age, education, and race/ethnicity; health information seeking controlled for age and education; cancer information seeking controlled for age, education, and race/ethnicity

^ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$

Table 5 Linear regression analyses testing optimism and spontaneous self-affirmation as simultaneous predictors of self-reported health, affect, and self-efficacy when controlling for sociodemographic and medical factors

	Self-reported health			Happiness			Hopefulness			Anger			Anxiety			Sadness			Self-efficacy for getting health information		
	B	SE	95 % CI	B	SE	95 % CI	B	SE	95 % CI	B	SE	95 % CI	B	SE	95 % CI	B	SE	95 % CI	B	SE	95 % CI
Optimism	0.23**	0.07	0.10, 0.37	0.36**	0.06	0.25, 0.47	0.45**	0.08	0.30, 0.60	-0.22**	0.06	-0.34, -0.11	-0.38**	0.08	-0.53, -0.23	-0.37**	0.06	-0.50, -0.24	0.19*	0.08	0.03, 0.36
Spontaneous self-affirmation	-0.04	0.07	-0.17, 0.09	0.02	0.05	-0.09, 0.12	0.18*	0.07	0.04, 0.32	0.02	0.05	-0.09, 0.12	0.09	0.07	-0.04, 0.23	0.12*	0.06	0.01, 0.24	0.11	0.18	-0.04, 0.27
Age	-0.01	0.01	-0.01, 0.002	-	-	-	-	-	-	-0.01**	0.01	-0.02, -0.01	-	-	-	-	-	-	-	-	-
Education	0.37**	0.09	0.22, 0.53	-	-	-	-	-	-	-0.21**	0.07	-0.35, -0.08	-	-	-	-0.14*	0.07	-0.29, 0.00	0.24**	0.09	0.06, 0.42
0–2 years since cancer diagnosis	-	-	-	-0.22^	0.13	-0.47, 0.02	-	-	-	0.16	0.13	-0.10, 0.41	-	-	-	-	-	-	-	-	-
6+ years since cancer diagnosis	-	-	-	0.02	0.10	-0.19, 0.22	-	-	-	-0.10	0.11	-0.30, 0.12	-	-	-	-	-	-	-	-	-

Note: Sociodemographic and medical factors were included as control variables only if they were significantly associated with a particular outcome at the bivariate level in preliminary analyses

^*p*<0.10; **p*<0.05; ***p*<0.01

was associated with greater confidence in getting health information ($\beta=0.54$, $SE=0.16$, $p<0.001$), whereas these factors were unassociated among men with cancer or women with non-breast cancer ($\beta=-0.06$, $SE=0.10$, $p=0.602$).

Of note, only two of the seven interactions not involving optimism remained significant when controlling for the main effect of optimism (i.e., SSA by self-efficacy predicting sadness, and SSA by gender and cancer site predicting confidence in getting health information). As such, we reiterate that the interaction analyses are meant to be exploratory and hypothesis generating.

Discussion

An estimated 3.3 million cancer survivors in the USA report poor physical health-related quality of life, with 1.4 million cancer survivors reporting poor mental health-related quality of life [6]. As of 2009, almost 500 studies of psychosocial interventions had been conducted to improve quality of life among cancer patients [55]. In a separate review, only 16 of these studies explicitly assessed mediators of these effects [16]. Additionally, fewer than 4 % of these studies were interventions designed to improve memory or concentration, suggesting that psychosocial interventions are not yet targeting cognitive deficits among cancer survivors [55]. Thus, the links identified among optimism and spontaneous self-affirmation with health-related outcomes suggest potentially important avenues for future research in this emerging field.

A major research focus has been to examine predictors of survivors' quality of life after a cancer diagnosis [22, 56]. In the present study, individuals higher in optimism consistently reported better health on nearly all indices examined (with the exception of information seeking), even when controlling for SSA and sociodemographic factors. These results are consistent with prior research demonstrating benefits of optimism, including more active coping strategies [18, 19, 21], the ability to make prudent decisions about where to allocate one's energies [57], and a reduction of the negative association of greater perceived ambiguity with lower intentions to learn potentially useful health information [58]. Of course, optimism could have shown such a consistent association with outcomes because all outcomes were self-reported, and optimistic people may be more likely to evaluate these factors positively. However, other studies have shown that optimism is not uniformly associated with self-reported positive outcomes, suggesting that effects of optimism are not due to biased self-reporting [23]. Regardless, these positive expectations were linked to self-reported beneficial health outcomes in the present study and contribute to a growing body of literature identifying positive correlates and benefits of optimism among cancer survivors [22–24].

Table 6 Logistic regression analyses testing optimism and spontaneous self-affirmation as simultaneous predictors of subjective cognitive and physical impairment and information seeking when controlling for sociodemographic factors

	Subjective cognitive impairment			Subjective physical impairment			Health information seeking			Cancer information seeking						
	B	SE	OR	95 % CI	B	SE	OR	95 % CI	B	SE	OR	95 % CI				
Optimism	-0.91**	0.25	0.40	0.25, 0.65	-0.42*	0.20	0.65	0.44, 0.97	-0.13	0.20	0.88	0.59, 1.31	0.02	0.23	1.02	0.65, 1.59
Spontaneous self-affirmation	-0.27	0.26	0.76	0.46, 1.26	-0.10	0.19	0.90	0.62, 1.31	0.35^	0.19	1.41	0.98, 2.03	0.46*	0.21	1.59	1.05, 2.41
Age	-	-	-	-	0.04**	0.01	1.04	1.02, 1.07	-0.01	0.01	0.99	0.97, 1.01	-0.04*	0.01	0.96	0.94, 0.99
Education	-0.63*	0.31	0.53	0.29, 0.98	-0.57*	0.24	0.57	0.36, 0.90	0.82**	0.24	2.28	1.43, 3.63	0.84**	0.28	2.32	1.35, 4.00
White	-	-	-	-	1.18^	0.66	3.26	0.89, 11.94	-	-	-	-	-	-	2.92	1.16, 7.35
Black or African American	-	-	-	-	2.29**	0.75	9.87	2.40, 40.51	-	-	-	-	0.73	0.59	2.08	0.66, 6.57

Note: Sociodemographic factors were included as control variables only if they were significantly associated with a particular outcome at the bivariate level in preliminary analyses
 ^ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$

We identified SSA as a newly documented psychological resource that may be associated with beneficial cognitive and mental health outcomes (and cancer information seeking) among cancer survivors. This study is one of only two of which we are aware that has examined self-affirmation among cancer survivors, and the only one that has assessed self-affirmation as an individual difference. In the other, Creswell and colleagues [33] posit that survivors who wrote more self-affirming statements may have reported less distress and fewer physical symptoms because of increased self-efficacy for coping with cancer. Our analyses present indirect support for this assertion by indicating that some correlates of SSA, including greater positive affect and health information seeking, may be more pronounced among survivors with lower self-efficacy for managing their health (although the majority of these interactions were not significant when controlling for optimism). Because SSA is by definition employed “when feeling threatened or anxious,” individuals who felt less able to cope with their cancer diagnosis may have felt more threatened and thus had the greatest need to self-affirm. Prospective data are needed to test mediational analyses and to determine whether SSA could actually lead to increased self-efficacy over time. Additionally, research might examine whether SSA is associated with specific coping strategies or construing meaning from one’s situation among cancer survivors [59].

Overall, optimism was more strongly related than self-affirmation tendencies to the measured outcomes; optimism was significantly associated with 9 out of 11 outcomes when controlling for SSA. Conversely, only 2 of the 5 initially significant associations involving SSA remained significant when controlling for optimism (i.e., cancer information seeking and hopefulness). Conceptually, optimism and self-affirmation are distinct. As operationalized in the present study and the broader program of research from which these items were derived [28], spontaneous self-affirmation is a tendency to reflect on one’s strengths and values when feeling threatened or anxious. Optimism is characterized by a tendency to have positive expectations about the future [17] and confers health benefits, but is not necessarily deployed in the face of threat in the same way that self-affirmation may be.

There are several reasons why optimism and SSA may not have been unique predictors. One is that optimism and SSA tap into similar underlying processes, such as greater ability to cope with and pay attention to threatening information, or greater self-efficacy, ultimately leading to similar beneficial endpoints. However, the associations of SSA and optimism with sociodemographic factors and health outcomes were not always consistent—and were notably different for information seeking—suggesting that they assess distinct constructs. Also, optimism and SSA were only moderately correlated. Another explanation is that being higher in optimism is one way in which trait SSA manifests itself—perhaps affirming oneself allows one to have more positive expectations, which leads to

specific actions or coping strategies that ultimately lead to better health outcomes. Alternatively, SSA might be one type of active coping strategy employed by optimists. Finally, the contiguous placement of the SSA and optimism items on the survey may have implied that these items comprised a unidimensional scale and thus increased similarity among responses. The findings reported here should be replicated using the full scales of optimism [46] and SSA [28], preferably measured non-contiguously.

The use of a subjective rather than objective measure of cognitive deficits in the present study has both advantages and disadvantages. Subjective reports and objective measures of cognitive deficits are imperfectly related; subjective assessments are more closely linked to anxiety, depression, and fatigue than are objective assessments [12, 14]. Consistent with these findings, cognitive impairment and affect were significantly associated in the present study. Both actual and perceived cognitive deficits can be associated with lower quality of life [9, 60, 61], suggesting that self-reported cognitive deficits are useful in understanding patient experiences. Although subjective assessments of cognitive decline are often more related to emotional distress than is actual cognitive performance [14], subjective assessments may be just as important depending on the research question. Self-reports typically involve rating an overall experience of impairment over a set amount of time, whereas objective assessments capture functioning only at one point in time [11]. Given our interest in understanding cancer survivors' subjective experience, a self-reported assessment of cognitive impairment is appropriate. However, it is important to note also that cognitive impairment was self-reported using only a single item, rather than a validated survey, and future research is needed to replicate this effect with a more comprehensive assessment of cognitive impairment.

The numbers of cancer survivors who reported cognitive and physical impairment in the present study were comparable to population estimates of 10.1 % of survivors reporting poor mental health-related quality of life, and 24.5 % reporting poor physical health-related quality of life [6], but may nevertheless be underestimated. In what is known as the healthy survivor bias effect (see for example [7]), cancer patients who do not survive or who are too ill to be motivated to or unable to complete a survey are generally not captured in survey research. Future research is needed to address whether the associations of optimism and SSA with health would be stronger or weaker in a potentially less healthy, more representative sample of survivors.

There are several limitations related to the study design and item measurement. A limitation of the present study is the use of cross-sectional data. Given that optimism is well-established as a stable personality trait [18], we can be somewhat confident that optimism led to beneficial outcomes rather than vice versa. However, it is largely unknown whether people self-affirm more when facing challenging life events, such as a cancer diagnosis, or become self-affirmers while coping with stressful

life events. Given that stressful life events often promote post-traumatic growth, including enhanced social and personal resources [62], some cancer survivors may self-affirm more post-diagnosis. Research may have identified this to some extent—79 % of cancer survivors in one study reported that they were more likely to reflect on life priorities post-diagnosis [56]. Additionally, many of the outcomes we examined are interrelated, as demonstrated by the significant correlations among these factors.

Neurological problems that cause cognitive impairment can also cause distress, whether directly or as a reaction to the cognitive impairment. As a result, depression and cognitive impairment often co-occur, and depression may actually signal neurological deficits [14]. Prospective studies, with the ability to test for mediation over time, will be useful to identify whether and how optimism and SSA may promote beneficial outcomes. Additionally, due to the lack of a prospective design, we do not know whether cognitive difficulties were present prior to the onset of cancer [11]. We statistically controlled for educational attainment, which was associated with cognitive functioning. Although we do not have evidence that any cognitive impairments reported in the present study were associated with the cancer or its treatment, it is nonetheless suggestive that cancer survivors who reported cognitive impairment also reported being less likely to spontaneously self-affirm.

A second limitation is the use of single-item or shortened versions of the majority of constructs examined, although similar scales have been used elsewhere (e.g., Midlife in the United States Project 1; [47]). This measurement strategy was due to space limitations, which is common for national and large-scale surveys (e.g., Midlife in the United States [48]; ClinSeq® [39]). In particular, being able to include only two items from the full self-affirmation scale may have limited our ability to identify significant relationships among self-affirmation and health outcomes. Relatedly, we were unable to assess many potentially important aspects of participants' cancer diagnosis, such as type of treatment or time since completion of treatment. However, important strengths of the study included the large sample and diversity of measures. A third limitation is the large number of analyses conducted, particularly those assessing whether SSA interacted with specific factors to influence health outcomes. As we did not adjust for multiple comparisons (and only one interaction effect survived such adjustment), and several of these interactions were not significant when controlling for optimism, these analyses should be considered exploratory and preliminary and should be replicated using larger samples and full measures.

Conclusions

Current approaches for treating or preventing cognitive deficits include pharmacological and cognitive rehabilitation approaches

[13–15], which are likely to be expensive and time-consuming. We identified two factors that may buffer against some of the negative effects of cancer treatment—optimism and SSA. The consistent associations of optimism with positive health-related measures suggest that optimism may be a useful indicator of maladjustment among cancer survivors. SSA is also promising because it has been shown to be malleable, is relatively easily induced, and the positive effects of self-affirmation appear to be recursive over time [26, 36]. Although health among cancer survivors is a complex issue with biological, genetic, and psychological factors as inputs, the potential for simple psychological interventions to result in substantial benefits should not be overlooked.

Authors Statement of Conflict of Interest and Adherence to Ethical Standards Jennifer M. Taber, William M.P. Klein, Rebecca A. Ferrer, Erin E. Kent, and Peter R. Harris declare that they have no conflict of interest. All procedures, including the informed consent process, were conducted in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

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